Programming a Two-Link Robot to Draw a Rectangle

EGR 445/545: Project 1

Overview

The goal for project 1 is to program a two-link robot to draw a rectangle on a white board. There are several stepping stones designed to help you complete this project.

The robot for this project will be controlled by two servos that receive commands from an Arduino. The Arduino will receive servo delay values over serial as two-byte integers from a laptop or a Raspberry Pi.

Your team will write Python code whose inputs are the coordinates of the lower left corner of the rectangle along with the width and height of the rectangle. The robot should then draw the rectangle on a white board using a dry erase marker.

Here are the recommended steps to successfully completing this project:

1. specify the lower left coordinates, width, and height in a cell in your Jupyter Notebook
2. determine the coordinates of intermediate points along the edges of the rectangle (stepping stone 1)
3. find the joint angles necessary to move the robot tip to the points determined in step 2 (inverse kinematics)
4. convert the joint angles to servo pulse widths (1000-2000 microseconds)
5. transmit those delays to the Arduino using two-byte serial (stepping stone 2)
6. send the pulse widths to the servos using `myservo.writeMicroseconds` (like in stepping stone 3)

Python + Arduino

This project will be done using Python in conjunction with an Arduino. Steps 1-4 above are done in Python and the servo pulse widths are transmitted from Python to Arduino using serial communication. The Arduino then sends the pulse widths it received via serial to the servos.